UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/582,982	07/10/2000	KATSUNORI ITOU	49657-742	4615

7590 10/10/2003

MCDERMOTT WILL & EMERY
600 13TH STREET NW
WASHINGTON, DC 20005-3096

EXAMINER	
WILKINS III, HARRY D	

ART UNIT	PAPER NUMBER
1742	

DATE MAILED: 10/10/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/582,982	Applicant(s) ITOU ET AL.
	Examiner Harry D Wilkins, III	Art Unit 1742

-- Th MAILING DATE of this communication appears on the cover sh et with the correspond nce address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 August 2003* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1 and 2* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1 and 2* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

1. The rejection under 35 USC 102 based on Adachi et al has been withdrawn and re-applied as a rejection under 35 USC 103 because of Applicant's amendment to the claimed range of Si.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1 and 2 are rejected under 35 U.S.C. 103(a) as being unpatentable over Adachi et al (JP 06-293939, with reference to the machine translation) ~~with support from~~ in view of Ochi et al (US 5,705,124).

Adachi et al teach (see abstract) bearing parts that are made from a high carbon, chromium steel that are used at high temperatures due to their excellent rolling fatigue values. Adachi et al teach (see Table 1) example steel no. 6, which contains 1.01 wt% C, 0.42 wt% Si, 0.39 wt% Mn, 0.012 wt% P, 0.012 wt% S, 1.63 wt% Ni, 2.37 wt% Cr, 0.039 wt% Al, 0.0081 wt% N, 0.0012 wt% Ti, 0.0011 wt% O and the rest Fe. Adachi et al teach (see paragraph 34 and Table 2) that the process of treating the steel was to harden at 840°C with an oil quench, followed by tempering at 220°C, which method produces a part that has a hardness of HRC 59.0.

This composition is within the presently claimed range, with the exception of the value of Si. However, the value of Si disclosed by Adachi et al is (see abstract) less

than 0.5 wt%. The presently claimed composition range of Si would have been obvious to one of ordinary skill in the art because the prior art range is close enough, e.g.-0.4999 wt% vs. 0.5 wt%, that it would have been expected to have the same properties, see MPEP 2144.05. In addition, the value of example steel no. 6, 0.42 wt%, is close enough to the presently claimed ranged that one of ordinary skill in the art would have expected the steel to have the same properties. Applicant has not demonstrated unexpected results within the presently claimed range with comparison to the disclosed range of Adachi et al.

Adachi et al teach that the mean carbide size for example 6 is 0.43 μm, but do not mention the maximum carbide size. However, as the composition of Adachi et al had an nearly identical composition and was treated by an identical process, one of ordinary skill in the art would have considered the steel of Adachi et al to possess a maximum carbide size of less than 8 μm as claimed.

Adachi et al do not expressly teach that the bearing parts are part of an antifriction bearing, however, the bearing parts of Adachi would have been expected by one of ordinary skill in the art to inherently have antifriction properties (a requirement for bearing steels) and, thus, the bearing parts would have been incorporated into an antifriction bearing, which is made from at least three parts, an inner ring, an outer ring and a rolling element (e.g.-roller or ball) as disclosed by Ochi et al at col. 1, lines 5-10.

Regarding claim 2, Adachi et al teach (see paragraph 24) that 0.03-2 wt% V may be added to the steel for creating small carbonitrides (charcoal nitride) and for raising temper-softening resistance.

4. Claims 1-2 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takata et al (US 4,642,219) in view of Ochi et al (US 5,705,124) and Applicant's admission of prior art, and further in view of "High Carbon Chromium Bearing Steels".

Takata et al teach (see abstract) a bearing steel which contains, by weight, 0.7 to 1.1% C, 0.15 to 1.6% Si, 0.15 to 1.15% Mn, less than 0.010% P, less than 0.002% S, 0.5 to 1.6% Cr, less than 0.015% Al, less than 0.0015% Ti, less than 0.0006% O, less than 0.005% N and the balance iron. The ranges of P, S, Cr, Al, Ti, O and N are within the presently claimed ranges. The ranges of C, Si and Mn overlap the presently claimed ranges. See MPEP 2131.03.

Takata et al do not teach that the bearing steel contains 0.53 to 3.0% Ni.

Ochi et al teaches a bearing steel that is similar in composition to the bearing steel of Takata et al. Ochi et al teach (see col. 5, lines 14-23) that Ni can be added at 0.1 to 2.0% to bearing steels for the purpose of improving the hardenability and extending the life of the bearing steel.

Therefore, it would have been obvious to one of ordinary skill in the art to have added Ni as taught by Ochi et al to the bearing steel of Takata et al because Ochi et al teach that Ni improves hardenability and extends the life of bearing steels.

The claim is directed to a "part" of an antifriction bearing having an inner ring, an outer ring and a rolling element. Takata et al in view of Ochi et al do not expressly teach that the steel is used as a part of an antifriction bearing, however, the bearing steel of Takata et al in view of Ochi et al would have been expected by one of ordinary skill in the art to have antifriction properties and, thus, be made into an antifriction

bearing, which contains an inner ring, an outer ring and a rolling element (e.g.-roller or ball) (for support see Ochi et al at col. 1, lines 5-10).

Takata et al teach (see col. 5, lines 3-9) that the bearing steel is quench hardened and then tempered at 170°C. Thus, Takata et al do not teach that the bearing is tempered at 180 to 350°C.

However, Applicant admits as prior art (see page 2, lines 7-12 of specification) that it was well known in the art to perform a high temperature tempering (300°C) on high temperature use bearing steels that have been quench hardened, such as SUJ2 or the like, or carbonitrided, such as SCM 420 or SNCM 815, in order to attain dimensional stability for use at high temperatures.

"High Carbon Chromium Bearing Steels" at page 1, in Table 2, describes the standard Japanese steel "SUJ2". SUJ2 steel has a composition that is very similar to the composition disclosed by Takata et al and Ochi et al. Thus, one of ordinary skill in the art would have expected the bearing steel of Takata et al in view of Ochi et al to have properties similar to SUJ2 steel.

Therefore, it would have been obvious to one of ordinary skill in the art to have used the bearing steel of Takata et al in a high-temperature bearing because the similar steel SUJ2 had been known to be used in high-temperature bearings and SUJ2 steel and the steel of Takata et al in view of Ochi et al have similar properties. The defects of the prior art SUJ2 high temperature bearing (see page 2, lines 13-16 of specification) were that the bearing had lower hardness, thus producing lower fatigue life and wear

resistance. However, as disclosed by Ochi et al, the Ni improves the hardenability of the alloy, thus, overcoming the problem associated with the prior art.

Therefore, it would have been obvious to one of ordinary skill in the art to have applied the conventional processing step of high-temperature tempering after quench hardening or carbonitriding to the bearing steel of Takata et al in view of Ochi et al because the high-temperature tempering aids the bearing in dimensional stability for use at high temperatures.

The claim states "having a structure subjected to tempering after quench hardening or carbonitriding, wherein the hardness after said tempering is at least HRC 58 when tempered at a temperature in a range of 180°C to 350°C and the maximum carbide size is not more than 8 μm". With respect to the property of hardness and maximum carbide size, the alloy composition taught by Takata et al in view of Ochi et al overlaps the alloy composition recited in the claims and the processing method of Takata et al in view of Applicant's admission of prior art and "High Carbon Chromium Bearing Steels" is identical to the process recited in the claims, and, therefore, one of ordinary skill in the art would have expected that the products taught by the references would have the same hardness and maximum carbide size as claimed.

Regarding claim 2, Takata et al teach (see abstract) optionally adding 0.05 to 0.50% Mo and 0.05 to 0.30% V.

Response to Arguments

5. Applicant's arguments filed 20 August 2003 have been fully considered but they are not persuasive. Applicant argued that:

a. Adachi et al fails to teach the presently claimed invention, as well as, fails to provide motivation to for increasing Si content above 0.5 wt%; and,

b. The Examiner has failed to provide a factual basis to support the conclusion that the steels of Takata et al, Ochi et al and SUJ2 steel were suitable for high temperature use.

In response to Applicant's first argument, while Adachi et al do fail to teach the presently claimed Si range of at least 0.5 wt% to not more than 3.0 wt%, Adachi et al does teach including less than 0.5 wt%. Thus, the range disclosed by Adachi et al is so close to the presently claimed range that one of ordinary skill in the art would have expected the two alloys to have the same properties. See MPEP 2144.05.

In response to Applicant's second argument, the points discussed in reference to this argument, in the Examiner's opinion, support the obviousness conclusion. Particularly, the two full paragraphs on page 6 of the remarks mention that the prior art SUJ2 steel was known to have a short service life under load that was caused by a disadvantageous reduction of hardness caused by the high temperature tempering when used for high temperature applications. However, as mentioned by Takata et al (see Table 2, where steel A is SUJ2 and steels F-N are inventive steels) the steel provides a greatly enhanced rolling lifetime (service life) over the prior art conventional bearing made of SUJ2 and Ochi et al teach (see col. 5, lines 15-23 and Tables 1-3) that Ni is added for increasing hardness, thus overcoming the problems associated with SUJ2, and that the service life of the steels including Ni (and V for present claim 2) (steels 10-12, where steel 13 is SUJ2) was increased by a factor of about 10 above the

lifetime given for a bearing made of SUJ2. Thus, it is apparent from the disclosures of Takata et al and Ochi et al that the deficiencies of the SUJ2 steel for high temperature service were solved by Takata et al and Ochi et al, and one of ordinary skill in the art, in possession of the information of Takata et al, Ochi et al and the fact that SUJ2 steel had been used for high temperature service, albeit with lackluster results, would have been led to apply the steel of Takata et al in view of Ochi et al for high temperature service because the steel of Takata et al in view of Ochi et al overcomes the known problem with using SUJ2 steel for high temperature service, that of reduced service life due to reduced hardness. In addition, the reference to JP 2-870831 in the remarks also supports this. It essentially says that SUJ2 can be used for high temperature service bearings, but has problems with lifetime due to lowered hardness. It does not say that SUJ2 is inappropriate, merely that it can be used, but with a limited service life. Also, while no single reference teaches simultaneous high temperature dimensional stability and surface hardness, the combination of references does teach this.

Conclusion

6. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not

mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Harry D Wilkins, III whose telephone number is 703-305-9927. The examiner can normally be reached on M-Th 10:00am-8:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy V King can be reached on 703-308-1146. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9306 for regular communications and 703-872-9306 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Harry D Wilkins, III
Examiner
Art Unit 1742

hdw

ROY KING
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700